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Organizational Changes and Policy Measures in the New Economy

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1. Introduction

An important tendency, emerged in the last decade with the diffusion of the “new economy” (i.e. the adoption of Information and Communication Technologies), is the introduction in many firms of new organizational schemes (involving job rotation, work teams, quality norms), characterized by multi-tasking. The studies undertaken in order to assess the effects of these new practices on firms performance and on working conditions show, on the one hand, a positive impact on productivity and, on the other hand, an ambiguous effect on workers well-being (with new organizational schemes reducing failures and making work more interesting but also increasing pressure on workers and raising injuries and mental strain). Since this is a crucial aspect that must be taken into account to evaluate the long-run sustainability of the “new economy paradigm”, it is important to investigate, also from a theoretical point of view, the consequences of the adoption of the new organizational schemes.

This paper (that extends and generalizes a previous contribution, see Boucekkine, Crifo and Mattalia, 2004) considers a model that studies the effects of multi-tasking in an economy in which individuals devote time both to production and to human capital accumulation (in order to acquire the knowledge necessary to use the new technologies) and in which they perform different tasks. In particular, this model assumes that multi-tasking not only increases output but it also increases costs for the firms (due to interactions among tasks) and induces disutility for the individuals (due to an increase in work rhythms when an individual is faced with many tasks to be performed). Different specifications of the cost function linked to the presence of multi-tasking are considered (so that these costs can be interpreted both as “coordination costs” or as “polyvalence costs”) and the decentralized solution (where households and firms solve separately their optimization problems) and the centralized solution (where a central planner solves the optimization problem) are compared for this economy. The main result is that the social optimum is characterized by a number of tasks per worker lower than the number obtained in the decentralized economy. Also consumption and production are lower in correspondence of the social optimum than in the decentralized solution, that is therefore sub-optimal (confirming the empirical findings according to which an extensive use of multi-tasking can have negative effects).

Some policy measures are then considered, in order to correct such sub-optimality; in particular, the effects of a tax applied on the consumer side, of a tax applied on the firm

side and of a form of labour regulation are studied. The conclusion that emerges is that the first two measures have no long-run effects on the number of tasks performed by each worker (that should be reduced), and only the third one can be successfully used to eliminate the sub-optimality that arises in the decentralized economy.

2. The model, the decentralized economy and the social optimum

The model (see also Boucekkine, Crifo and Mattalia, 2004 for a more detailed description and derivation) considers an economy in discrete time, with a productive side characterized by a representative firm that produces according to the technology:

$$y_t = A_t \cdot (h_t \cdot T_t \cdot L_t)^{1-\alpha} \cdot (n_t)^\alpha$$

where $0 < \alpha < 1$, A_t is a productivity parameter, L_t is the number of workers with human capital h_t , T_t is worker's productive time and n_t is the number of tasks performed per worker.

The profits (assuming the price of output equal to 1) are then given by:

$$\pi_t = A_t \cdot (h_t \cdot T_t \cdot L_t)^{1-\alpha} (n_t)^\alpha - f_t - w_t \cdot h_t \cdot T_t \cdot L_t$$

where w_t is the wage rate per efficiency unit of labor and f_t is a function that represents the costs linked to the presence of multi-tasking. Different specifications can be adopted for this function, for instance $f_t = d_t \cdot (n_t / n_{t-1})^\theta$ (so that these costs depend on the rate of change in the number of tasks performed per worker), $f_t = d_t \cdot (n_t / n_{t-1})^\theta / (h_t T_t)$ (so that they depend inversely also on the level of human capital and on productive time), $f_t = d_t \cdot n_t^\theta$ (so that they depend on the absolute number of tasks performed per worker), with $d_t > 0$ and $\theta > 0$. In this way, the different formulations allow to interpret these costs both as “coordination costs” and as “polyvalence costs” linked to the presence of multi-tasking (the idea is that increasing the number of tasks per worker raises costs because of interactions among tasks, see Becker and Murphy, 1992). The consequence is that, on the one hand, multi-tasking increases output but, on the other hand, it also induces costs which reduce profits.

The consumption side is then characterized by a representative household that has a utility function given by:

$$u(c_t, n_t) = \ln c_t - \gamma \cdot (n_t)^{1+\sigma}$$

where c_t is consumption and $-\gamma \cdot (n_t)^{1+\sigma}$ represents the disutility for the individuals deriving from multi-tasking, with $\gamma > 0$ and $\sigma \geq 0$ (the idea is that increasing the

number of tasks per worker increases work rhythms, and work intensification induces disutility, see Askenazy, 2001).

The household then holds assets a_t and is endowed with one unit of time each period, that is spent on working (the fraction T_t) or on human capital accumulation (the fraction $1 - T_t$), and the accumulation of human capital is described by the equation:

$$h_{t+1} = E_t \cdot h_t^\delta \cdot (1 - T_t)^{1-\delta}$$

where $\delta > 0$ and E_t is an efficiency parameter.

Given this structure of the model, the decentralized economy is characterized by the fact that household and firm solve separately their optimization programs. The household's intertemporal optimization problem is:

$$\begin{aligned} \max_{\{c_t, T_t, a_{t+1}, h_{t+1}\}_{t=0}^{\infty}} \quad & \sum_{t=0}^{\infty} \beta^t [\ln c_t - \gamma(n_t)^{1+\sigma}] \\ \text{s.t.} \quad & a_{t+1} = (1 + r_t)a_t + w_t h_t T_t - c_t \\ & h_{t+1} = E_t h_t^\delta (1 - T_t)^{1-\delta} \end{aligned}$$

where β is the discount factor (with $0 < \beta < 1$) and r_t is the interest rate, while the firm's intertemporal optimization problem is:

$$\max_{\{n_t, T_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \frac{1}{(1 + r_1)(1 + r_2) \cdots (1 + r_t)} [A_t (h_t T_t L_t)^{1-\alpha} (n_t)^\alpha - f_t - w_t h_t T_t L_t]$$

The centralized economy, on the contrary, is characterized by the presence of a central planner that solves the following intertemporal optimization problem:

$$\begin{aligned} \max_{\{c_t, T_t, n_t, h_{t+1}\}_{t=0}^{\infty}} \quad & \sum_{t=0}^{\infty} \beta^t [\ln c_t - \gamma(n_t)^{1+\sigma}] \\ \text{s.t.} \quad & c_t = A_t (h_t T_t L_t)^{1-\alpha} (n_t)^\alpha - f_t \\ & h_{t+1} = E_t h_t^\delta (1 - T_t)^{1-\delta} \end{aligned}$$

Solving these problems, writing the equations that characterize the steady-state and finding the corresponding values of the different variables, the main result is that, at the steady-state, the centralized economy is characterized by a number of tasks per worker, a level of production and a level of consumption lower than the corresponding values in the decentralized economy. This is due to the fact that in a centralized economy the central planner takes into account the disutility on individuals caused by an excessive number of tasks per worker, while in a decentralized economy this aspect is neglected by the firms that choose the number of tasks performed.

The decentralized solution is therefore sub-optimal (confirming the empirical findings according to which an extensive use of multi-tasking can have negative effects), and at this point some policy measures can be considered, in order to correct such sub-optimality.

3. Policy measures and conclusions

A first policy measure is represented by a tax applied on the consumer side, more precisely a tax applied on the labour income of the consumers, so that the wage earned per unit of labour becomes $w_t(1 - \tau_h)$ where τ_h is the tax rate applied to the households.

A second policy measure is represented by a tax applied on the firm side, more precisely a tax applied on the labour cost of the firm, so that the amount paid by the firm per unit of labour becomes $w_t(1 + \tau_f)$ where τ_f is the tax rate applied to the firm. Nevertheless, solving the optimization problem of the decentralized economy in these two cases it turns out that the steady-state values of the different variables (in particular of the number of tasks performed per worker) are not affected by the tax rates, and therefore these kinds of policies cannot be used to correct the sub-optimality of the economy.

A third policy measure that can be applied is represented by a form of labour regulation, according to which the government increases the number of hours worked. In this case it is possible to show that the effect is a decrease in the number of tasks performed per worker, and this effect lasts also in the long-run.

The conclusion of the analysis is therefore that the first two policies have no long-run effects on the relevant variables, and only the third type of policy measure can be successfully used in order to correct the sub-optimality that arises in the decentralized economy.

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